304-CD-005-002

EOSDIS Core System Project

Release B System Requirements Specification for the ECS Project

This document has not yet been approved by the Government for general use or distribution.

May 1996

Hughes Information Technology Systems
Upper Marlboro, Maryland

Release B Segment Requirements Specification for the ECS Project

May 1996

Prepared Under Contract NAS5-60000
CDRL Item #045

SUBMITTED BY

Rick Kochhar /s/ 5/28/96

Rick Kochhar, Release B CCB Chairman Date
EOSDIS Core System Project

Hughes Information Technology Systems
Upper Marlboro, Maryland

This page intentionally left blank.

Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. Changes to this document shall be made by document change notice (DCN) or by complete revision.

This document is under the control of the ECS Release B Configuration Control Board (CCB).

Any questions should be addressed to:

Data Management Office
The ECS Project Office
Hughes Information Technology Systems
1616 McCormick Drive
Upper Marlboro, MD 20774-5372

This page intentionally left blank.

Abstract

This document specifies the Level 4 requirements for the Science and Data Processing System and Communication & System Management System Segments of the ECS Project. Requirements for all releases up to and including Release B are included in this document. The document presents the requirements in the form of upward traceability tables that have been extracted directly from the RTM database as at the 3/1/96 baseline. The appendices include material that accompanies the requirements, including a TBD list and work-off plan, downward traceability information, performance and capacity characteristics and Release C requirements.

This document is a combined document that covers both of the above-mentioned segments.

Keywords: level-4, segment, requirement, specification, SRS, SDPS, CSMS, CSCI, CI, interface, performance, data, type, services

This page intentionally left blank.

Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title	Submitted as Final
iii through xii	Submitted as Final
1-1 through 1-4	Submitted as Final
2-1 through 2-4	Submitted as Final
3-1 through 3-12	Submitted as Final
4-1 through 4-1900	Submitted as Final
A-1-and A-2	Submitted as Final
B-1- through B-1238	Submitted as Final
C-1 through C-4	Submitted as Final
D-1 and D-2	Submitted as Final
E-1 through E-18	Submitted as Final
F-1 through F-98	Submitted as Final
G-1 and G-2	Submitted as Final
H-1 and H-2	Submitted as Final
I-1 and I-2	Submitted as Final
J-1 through J-8	Submitted as Final
K-1 through K-20	Submitted as Final
AB-1 through AB-6	Submitted as Final
GL-1 through GL-6	Submitted as Final

Document History			
Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
304-CD-002-001	Review	January 1995	95-07-03
304-CD-002-002	Final	March 1995	95-07-03
304-CD-003-002	Final	March 1995	95-07-03
304-CD-005-001	Submitted as Final	October 1995	95-07-03
304-CD-005-002	Submitted as Final	May 1996	96-0528

This page intentionally left blank.

Contents

4. Requirements

Appendix H. -- Deleted

Appendix I. -- Deleted

Appendix J. Release C Look Ahead Requirements

Appendix K. Data Glossary

Glossary of Terms

Abbreviations and Acronyms

List of Figures

List of Tables

1. Introduction

1.1 Identification

The Release B System Requirements Specification for the ECS Project, Contract Data Requirements List (CDRL) Item 045, whose requirements are specified in Data Item Description (DID) 304/DV1, is a required deliverable under Contract NAS5-6000.

This issue of the document has been made necessary by the disapproval of the previous issue (304-CD-005-001) by NASA as communicated to ECS on January 22, 1996. ECS subsequently responded to NASA in White Paper 420-WP-007-001. This issue of the document takes into account the responses made in that White Paper and includes modifications made to the requirements incorporated into the RTM MAIN database before March 1st, 1996. Section 4.1 includes a list of CCRs that are outstanding that reflect the remaining actions from the White Paper.

Explanatory notes that describe the changes in organization and content from the IDR version of the document to this CDR version are to be found in Section 1.6 below.

1.2 Purpose

This document specifies the functional and performance requirements for the Science Data Processing and Communication and System Management Segments for Releases Ir1, A & B of ECS. It describes the Level 4 requirements, organized by subsystem and traces them to the parent Level 3 requirements. Full text of both the Level 4 and the parent RbRs (Requirements by Release) is given to facilitate analysis of coverage and traceability issues. Appendix B provides the downward traceability from the RbRs to the Level 4 requirements. Full text is also provided in that appendix.

1.3 Scope

The Release B Segment Requirements Specification defines the SDPS and CSMS Level 4 requirements for Releases Ir1, A and B. Although a complete set of Release C requirements is not yet available, Release C L4 requirements are included in Appendix J for the sake of completeness of representation of the requirements database.

Release IR-1 provided support to TRMM Early Interface Testing and Science Algorithm I&T. Release A provides support to TRMM Science Operations and TRMM Ground Systems Certification Testing. Release A also provides the functional capabilities needed to support early ESDIS Ground System Testing for the EOS AM-1 and Landsat 7 missions. Release B provides support to EOS AM-1 Mission Operations and Science Operations, and it provides support to ESDIS Ground System Certification Testing for the EOS AM-1 and Landsat 7 missions. Release B also provides services for the Landsat 7, ADEOS, SAGE III, ALT RADAR, DAO, ERS, JERS, RADARSAT and COLOR missions. Releases C & D will provide evolutionary enhancements to the ECS services provided in the earlier releases. The Release C and D requirements will be expanded further during the respective preliminary design phases for these releases.

This document has been generated from the Requirements & Traceability Management (RTM) tool and as such represents a snapshot of the database from which it was generated, i.e. RELB_CDR_030196. Section 4.1 presents details of the approach taken to migration of requirements between ECS releases and the corresponding representation in the RTM database.

This document reflects the February 1996 Technical Baseline maintained by the contractor configuration control board in accordance with ECS Technical Direction No. 11 dated December 6, 1994.

1.4 Status and Schedule

This submittal of DID 304/DV1 meets the milestone specified in the Contract Data Requirements List (CDRL) of NASA Contract NAS5-60000.

This document reflects the Technical Baseline submitted via contract correspondence number ECS 210-TP-001-004.

1.5 Organization

The document is organized to describe the Level 4 Science and Data Processing System and Communications and System Management Segment Requirements and their traceability to the L3 and IRD RbRs.

Section 1.0 provides information regarding the identification, scope, purpose, status, and organization of this document and some explanatory notes on the changes since the previous issue of 304.

Section 2.0 provides a listing of related documents, which were used as source information for this document.

Section 3.0 provides overviews of the ECS system, the ECS Interfaces, the SDPS and CSMS and background information to put the requirements into context.

Section 4.0 describes the Level 4 requirements. The requirements are organized by subsystem and numerical order. Corresponding text for the parent RbRs is provided alongside the Level 4 text. Each subsystem is described briefly in textual form and the requirements follow this presented as a table.

Appendix A contains the performance and sizing requirements tables for the CSMS segment.

Appendix B contains the table of L3 RbRs to Level 4 requirements to present the downwards traceability established. This appendix allows efficient analysis of completeness and coverage issues.

Appendix C contains a list of L4 requirements that include a “TBD”. A brief work-off plan is provided for each such requirement.

Appendix D is not used in this issue of the document.

Appendix E contains tables describing processing loads associated with Data Products, and tables describing data throughput and storage volumes.

Appendix F contains a Data Type Matrix showing data type services for the various science data products, by release.

Appendix G is not used in this issue of the document.

Appendix H is not used in this issue of the document.

Appendix I is not used in this issue of the document.

Appendix J contains Release C look-ahead L4 requirements.

Appendix K contains a glossary of data names used to identify the data referenced by the requirements.

The Glossary of Terms section contains a glossary of general terms used in describing the requirements.

The Abbreviations and Acronyms section contains an alphabetical list of the abbreviations and acronyms used in this document.

1.6 Changes for this issue

This issue of the requirements specification has been generated from the 030196 baseline version of the RTM requirements database. This document represents the official CDR baseline requirements document. This section describes the changes that have been made to the content and organization of the document since the last issue for Release-B IDR in October 1995.

The document has been modified in the following key areas:

- presentation of the requirements

- handling of interfaces and context information

- content of appendices.

Requirements are now presented in Section 4 and Appendix B. In Section 4, in the main body of the document, the L4 requirements are listed in order of numerical sequence on a subsystem by subsystem basis. Each L4 is shown with its parent RbRs and their texts. This layout will allow efficient examination of the traceability and coverage issues that arose in the NASA comments on the previous requirements specification issue. Appendix B shows the reverse traceability to the L3 RbRs with corresponding texts.

The handling of interfaces has been altered significantly from the previous issue. Appendix D, which listed data flows between interacting entities within and outside ECS and the corresponding traces to L4 requirements, has been dropped. This appendix was useful in serving a purpose during the requirements analysis that led to the initial definition of Release B L4 requirements. However, the information contained within it has now been superseded as the design has progressed. Efforts to update the appendix would amount to “reverse engineering” of the tables from more recent design and interface documentation. Both the duplication of effort and information and the increased risk of divergence have now been avoided by deleting this information from this document. For further details of interface definitions, the reader should refer to Section 3 of the relevant 305 design document, to the 313 Internal Interface Control Document or to the series of 209 documents that define the external interfaces.

In addition, the context diagrams have been removed from Section 4 for the same reasons. These are presented in the corresponding 305 design documents for each subsystem.

The N^2 diagrams in Section 3.2 have been retained however, as they offer an overview into the interactions that occur within ECS, and between ECS and external entities, that cannot be found elsewhere. The diagrams have been updated from the IDR issue and reflect the CDR baseline. The pointers from the N^2 into Appendix D have been replaced by pointers to the relevant 305 or 209 document that provides the details of the corresponding interface.

The content of the appendices has changed in that the appendices which presented changes to the requirements baseline between Release A & B have now been removed as they served their purpose in the last issue. Hence Appendices G, H and I have all been deleted. Appendix J however has been retained as Release C requirements are not yet in a complete state and could create unnecessary confusion if included in the main body of the document.

Appendices B & C which were reserved for traceability tables in the previous issue have also changed their purpose. Appendix B is now the traceability table including requirements texts from L3 RbRs to L4 requirements. Responding to specific NASA comment to the effect, Appendix C is a new appendix presenting all Release A & B requirements with TBD elements in them and a corresponding work-off plan for each.

2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which this Requirements Specification's scope and content are derived.

194-219-SE1-001	Interface Requirements Document Between EOSDIS Core System (ECS) and the NASA Science Internet (NSI)
193-219-SE1-008	Interface Requirements Document Between EOSDIS Core System (ECS) and Program Support Communications Network
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
505-41-11	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the Version 0 System
505-41-12	Goddard Space Flight Center, Interface Requirements Document between EOSDIS Core System (ECS) and Science Computing Facilities
505-41-13	Goddard Space Flight Center, Interface Requirements Document between Earth Observing System Data and Information System (EOSDIS) and the Landsat 7 System
505-41-14	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Tropical Rainfall Measuring Mission (TRMM) Ground System
505-41-15	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Earth Observing System (EOS) AM-1 Flight Operations
505-41-19	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Affiliated Data Centers
541-41-21	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and NASA Institutional Support Systems
560-EDOS-0211.0001	Goddard Space Flight Center, Interface Requirement Document Between the EOSDIS Data and Operations System (EDOS) and EOS Ground System (EGS) Elements

2.2 Applicable Documents

The following documents are referenced within this Requirements Specification, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

194-207-SE1-001	System Design Specification for the ECS Project
304-CD-001-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 1: General Requirements
304-CD-004-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 2: Mission Specific
222-TP-003-006	Release Plan Content Description for the ECS Project
423-16-02	Goddard Space Flight Center, PGS Toolkit Requirements Specification for the ECS Project
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
none	Goddard Space Flight Center, EOS AM-1 Ground Systems Requirements

2.3 Information Documents

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of this Requirements Specification.

194-201-SEI-001	Systems Engineering Plan for the ECS Project
209-CD-003-003	Interface Control Document Between EOSDIS Core System (ECS) and the EOS-AM Project for AM-1 Spacecraft Analysis Software
209-CD-004-003	Data Format Control Document for the ECS Flight Operations Segment AM-1 Project Data Base
220-CD-001-004	Communications Requirements for the ECS Project
194-WP-902-002	ECS Science Requirements Summary for the ECS Project
560-EDOS-0230.0001	Goddard Space Flight Center/MO&DSD, Earth Observing System (EOS) Data and Operations System (EDOS) Data Format Requirements Document (DFRD)
530-DFCD-NCCDS/POCC	Goddard Space Flight Center/MO&DSD, Data Format Control Document Between the Goddard Space Flight Center Payload Operations Control Centers and the Network Control Center Data System
502-ICD-JPL/GSFC	Goddard Space Flight Center/MO&DSD, Interface Control Document Between the Jet Propulsion Laboratory and the Goddard Space Flight Center for GSFC Missions Using the Deep Space Network
FIPS PUB 127-1	Federal Information Processing Standards Publication: Database Language SQL
RFC768	J. Postel; User Datagram Protocol, 8/28/80
RFC791	J. Postel; Internet Protocol, 9/1/81 (obsolete/updated by RFC1060)
RFC792	J. Postel; Internet Control Message Protocol, 9/1/91

RFC793	J. Postel; Transmission Control Protocol, 9/1/91
RFC821	J. Postel; Simple Mail Transfer Protocol, 8/1/82
RFC826	D. Plummer; Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware, 11/1/82
RFC854	J. Postel, J. Reynolds; Telnet Protocol specifications, 5/1/83
RFC894	C. Hornig; Standard for the Transmission of IP Datagrams Over Ethernet Networks, 4/1/84
RFC895	J. Postel; Standard for the Transmission of IP Datagrams Over Experimental Ethernet Networks, 4/1/84
RFC903	R. Finlayson, et al; Reverse Address Resolution Protocol, 6/1/84
RFC959	J. Postel, J. Reynolds; File Transfer Protocol, 10/1/85
RFC977	B. Kantor, P. Lapsley; Network News Transfer Protocol: A proposed Standards for the Stream-Based Transmission of News, 2/1/86
RFC1058	C. Hedrick; Routing Information Protocol, 6/1/88
RFC1060	J. Postel, J. Reynolds; ASSIGNED NUMBERS, 3/20/90 (obsolete/ updated by RFC1340)
RFC1157	M. Schoffstall, et al; A Simple Network Management Protocol (SNMP), 5/10/90
RFC1188	D. Katz; A Proposed Standard for the Transmission of IP Datagrams over FDDI Networks, 10/30/90 (obsolete/updated by RFC1390)
RFC1209	J. Lawrence, D. Piscitello; The Transmission of IP Datagrams Over the SMDS Service, 3/6/91
RFC1213	K. McCloghrie, M. Rose; Management Information Base for Network Management of TCP/IP-based Internets: MIB-II, 3/26/91
RFC1340	J. Reynolds, J. Postel; ASSIGNED NUMBERS, 7/10/92
RFC1374	J. Renwick, A. Nicholson; IP and ARP on HIPP, 11/2/92
RFC1390	D. Katz; Transmission of IP and ARP over FDDI Networks, 1/5/93
RFC1411	D. Borman; Telnet Authentication: Kerberos Version 4, 1/26/93
RFC1521	N. Borenstein, N. Freed; MIME (Multipurpose Internet Mail Extensions) Part one: Mechanisms for Specifying and Describing the Format of Internet Message Bodies, 9/23/93
RFC1522	K. Moore; MIME (Multipurpose Internet Mail Extensions) Part two: Message Header Extensions for Non-ASCII Text, 9/23/93
RFC1583	J. Moy; OSPF Version 2, 3/23/94
RFC1623	F. Kastenholz; Definitions of Managed Objects for the Ethernet-like Interface Types, 5/24/94

This page intentionally left blank.

3. System Description

3.1 Overall System Description

3.1.1 Release Ir1 & A Summary

Release IR-1 provided support to TRMM Early Interface Testing and Science Algorithm I&T. Release A provides support to TRMM Science Operations and TRMM Ground Systems Certification Testing. Release A also provides the functional capabilities needed to support early ESDIS Ground System Testing for the EOS AM-1 and Landsat 7 missions.

3.1.2 Release B

The mission of Release B is to provide an end-to-end system that supports multiple satellites and instruments, not a unique system for each. In addition to functions, services and data provided by Release A, Release B will provide flight operations for EOS AM-1 and data functions for EOS AM-1, Landsat-7, ADEOS II, COLOR and other NASA-identified data collections (including ALT RADAR, SAGE III and ACRIMSAT). The data from each EOS instrument will be sent to the Distributed Active Archive Center (DAAC) responsible for processing, archiving, and distributing EOS and related data. These data centers will house the ECS computing facilities and operational staff needed to produce EOS Standard Products and to manage, store, and distribute EOSDIS data, as well as the associated metadata and browse data, that allow effective use of the data holdings. The DAACs will exchange data via dedicated EOSDIS networks to support processing at one DAAC which requires data from another DAAC. In addition, ECS at GSFC will provide an integrated environment for the DAO.

Release B represents the initial EOS AM launch ready configuration of ECS, including functionality described by the ECS Specification for mission operations, the Goddard Space Flight Center Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System dated June 2, 1994, Revision A with CH-01,02,03,04 and 06 incorporated on April 25, 1995. Additionally, Release B includes the capacity to perform initial post-launch science processing for EOS AM, plus the functions, services and data provided by previous releases. This release provides full functionality to support the missions described below. This release also provides the capacity to support Integration and Test (I&T) of new science algorithms and ECS upgrades in parallel with production operations.

3.1.3 Releases C & D

Releases C and D will support future EOS missions, such as EOS PM-1, and will incorporate evolutionary changes such as new processing and storage technologies. Successive releases will provide expanded and increasingly sophisticated data search and access capabilities, based on feedback from the science community.

3.2 ECS Interfaces

This section provides information relating to the interfaces that ECS has with external entities and the interfaces that exist within the ECS system between its cooperating subsystems.

3.2.1 External Interfaces

This section describes the external interfaces to ECS.

The ECS subsystem to external interface diagram (Figure 3.2-1) shows the flow of data between the ECS subsystems and each external source. The flow contents are contained in the 209 series of documents indicated in the nodes on the diagram. There are no flows on the diagram between ECS components (the shaded part of the diagram) since they are captured in the ECS Internal interface diagram in Section 3.2.2 below. Also, there are no flows for items to the right and below ASTER GDS, due to the fact that the N^2 diagram does not capture the flows between external sources.

In this section, MSFC is still shown as having a DAAC even though it has been removed from the Technical Baseline. It has been removed from text and diagrams where the physical presence is referred to, e.g. in Section 4.10 in the ISS Interconnection diagram, but remains in this section where it represents a logical DAAC that has yet to be reallocated physically.

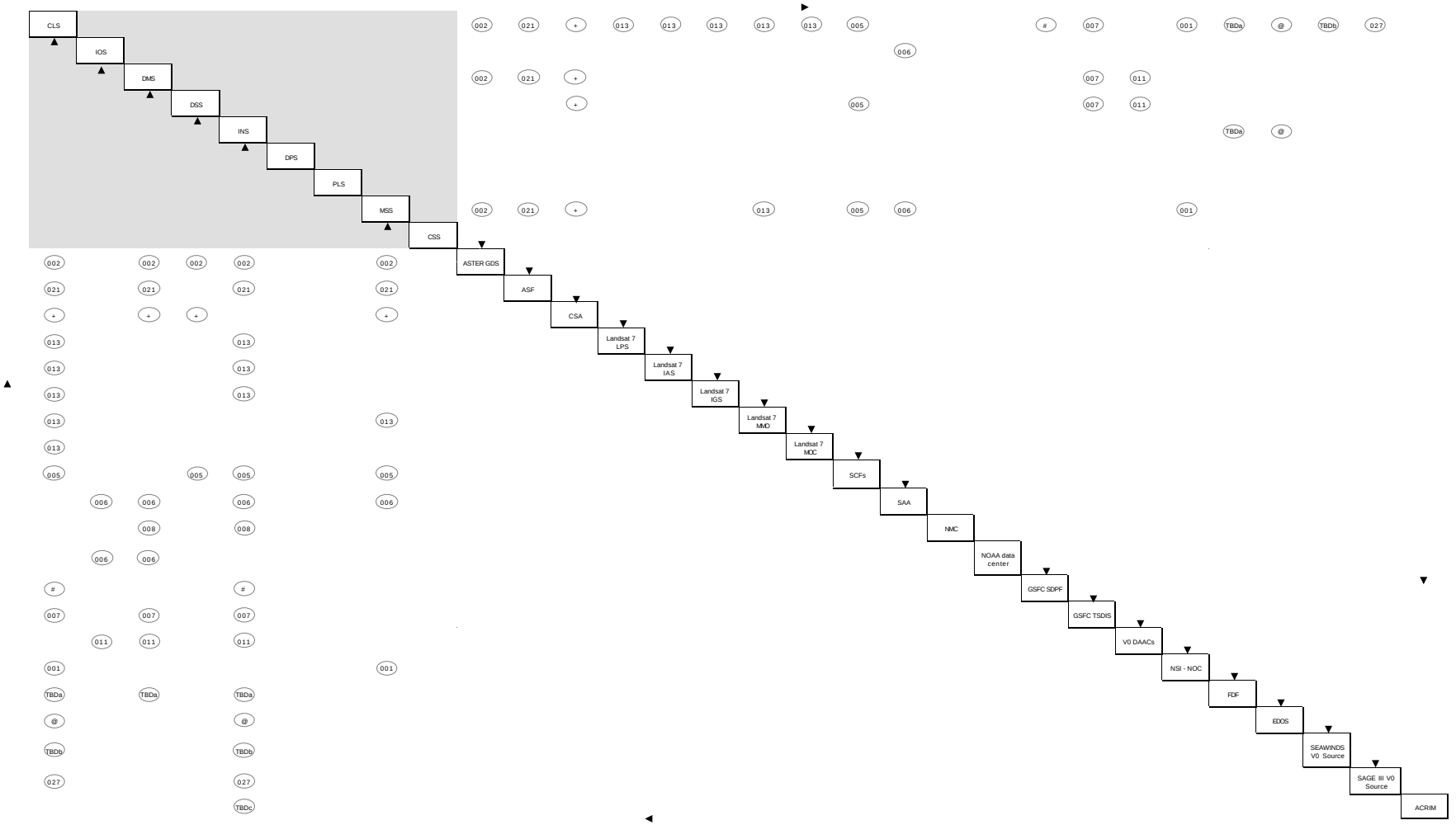

Figure 3.2-1. ECS Subsystem to External Interfaces

\+ - No ICD/IRD exists between CSA and ECS
\# - ICD managed by SDPF. Document no. is 506-203.103
TBDa - ICD managed by FDF. Document in work.
@ - Document managed by EDOS. ESDIS doc. 505-41-30, EDOS doc. 560-ICD-EDOS/ECS
TBDb - Document will be managed by NASDA. IRD in preparation.
TBDc - No interface documentation established yet.

The N^2 diagram should be interpreted as follows; the upper right portion of the N^2 diagram goes from an entity on the diagonal to an entity on its lower right along the diagonal. For the lower left portion of the N^2 diagram, the data flow goes from an entity on the diagonal to an entity that is on the left upper portion of the diagonal.

The numbers within the nodes represent a pointer to the 209 volume (209-CD-xxx-00n, where xxx is the pointer in the diagram) in which the detailed flow information can be found. Sections 3 and 5 in the 209 series of documents contain the flow information.

3.2.2 ECS Internal Interfaces

This section contains the N^2 diagram (Figure 3.2-2) that shows the internal inter-subsystem interfaces in ECS Release B. Each node of the diagram contains a pointer to the 305 volume that defines the flows for that interface. Section 3 of the 305 documents contain detailed flow information. The pointer is to 305-CD-xxx-00n, where xxx is the reference in the nodes on the diagram. Each node contains two numbers representing the 305 at each end of the interface. Note also that document 313-CD-006-002 contains full details of all ECS internal interfaces.

The subsystem to subsystem interface diagram shows the flow of data from one subsystem to another subsystem. These are generic flows that may be inter- or intra-DAAC. The specific inter-DAAC and inter-subsystem flows are described in Section 3.2.3.

The N^2 diagram is interpreted as follows; the upper right portion of the N^2 diagram goes from an entity on the diagonal to an entity found on its lower right along the diagonal. For the lower left portion of the N^2 diagram, the data flow goes from an entity on the diagonal to an entity that is on the left upper portion of the diagonal.

3.2.3 ECS Inter-subsystem Inter-DAAC Interfaces

This section contains the N^2 diagram (Figure 3.2-3) that shows the generic inter-DAAC, inter subsystem interfaces, i.e., one subsystem in a given DAAC communicates with another subsystem or an instance of itself in another DAAC. This captures the interoperation of ECS subsystems across different sites. Furthermore, the SMC is included because it contains some unique data flows pertaining to planning, configuration management, and security.

Each node of the diagram contains a pointer to the relevant 305 document(s) for the interface. As above the pointer consists of two sets of numbers where the three digits refer to the document number number, e.g. 305-CD-xxx-00n. The pointer represents the xxx. The two sets of numbers represent the 305 documents at each end of the interface.

Looking at the portion of the N^2 diagram above the diagonal, data flows occur as follows: an entity found on the diagonal sends data to an entity found on the lower, right level on the diagonal. Looking at the portion of the N^2 diagram below the diagonal, data flows occur as follows, an entity found on the diagonal sends data to an entity found on the upper, left level on the diagonal.

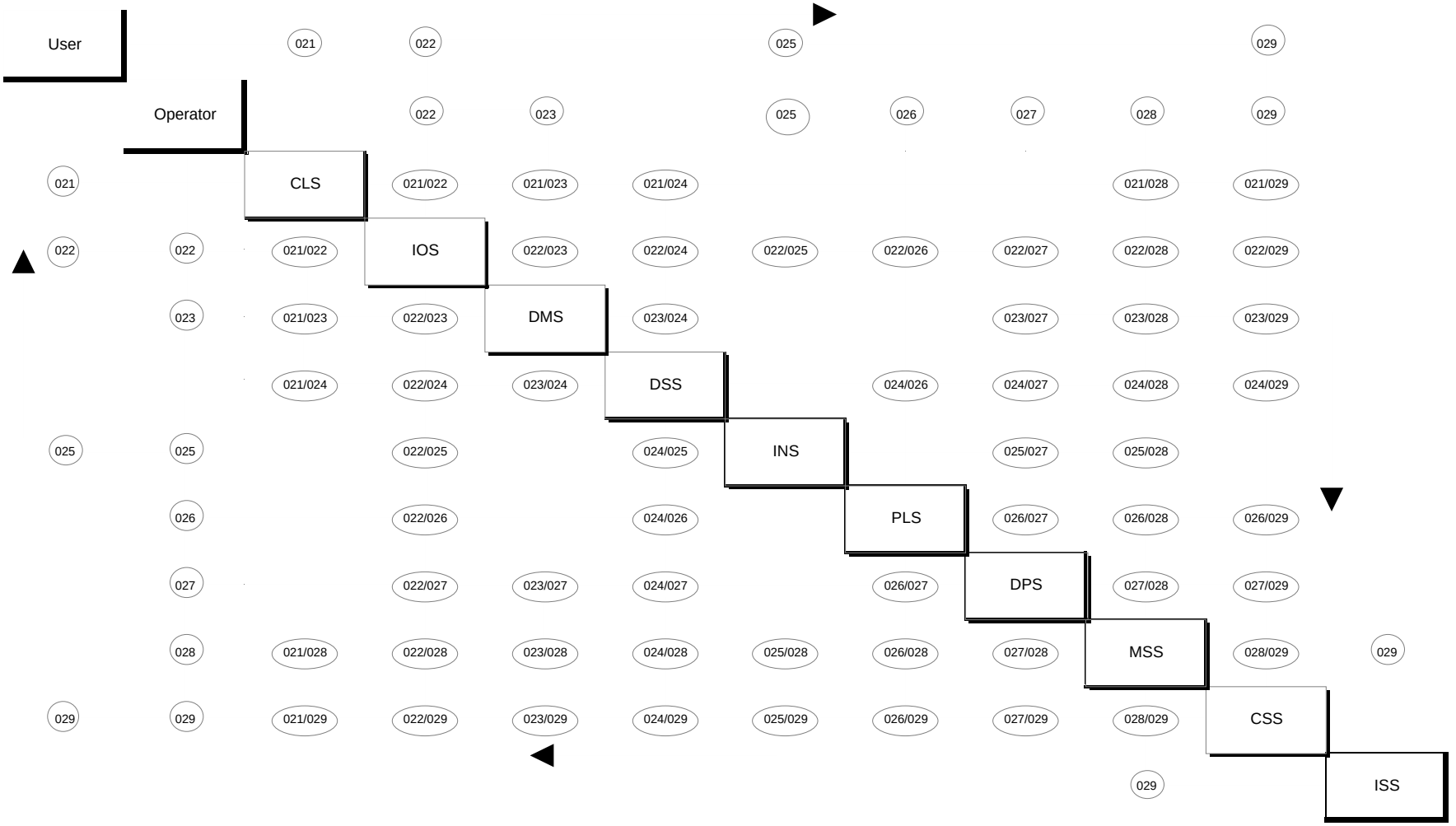

Figure 3.2-2. ECS Internal Subsystem to Subsystem Interfaces

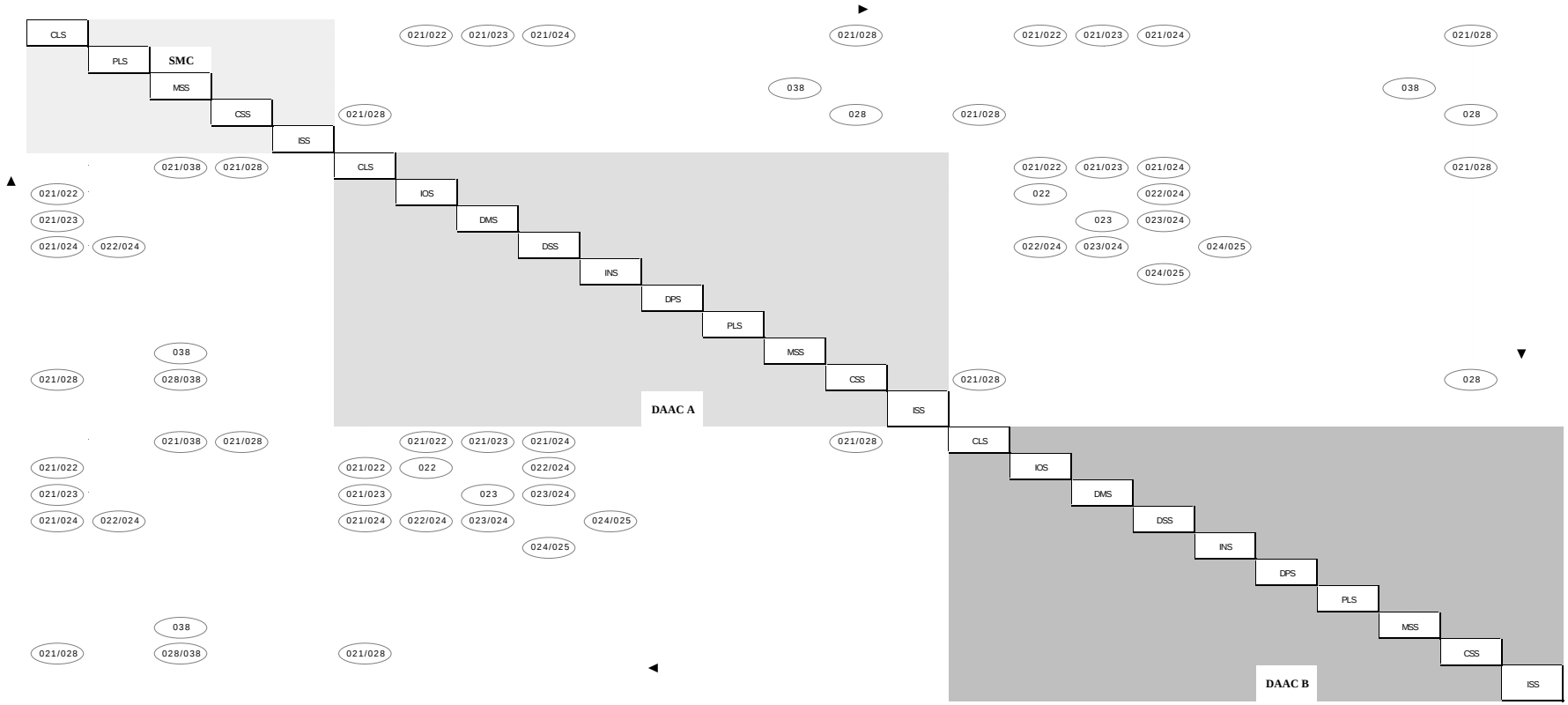

Figure 3.2-3. ECS Internal Inter-DAAC Inter-Subsystem Interfaces

3.2.4 Specific DAAC to DAAC Interfaces

This section, included for completeness and information purposes, contains an N^2 diagram (Figure 3.2-4) that indicates the Release B interfaces which exist between ECS instances installed at specific DAACs. The nodes represent unique DAAC to DAAC interfaces and the numbers within the nodes represent pointers into either the 209 series of documents or the 305 series of documents. The pointers provide the document series followed by the document number within the series. Where a "slash" separates two document numbers, they represent the documents at each end of the interface in the case of the 305 documents..

Figure 3.2-4 provides an N^2 diagram illustrating the unique data flows between specific DAACs, namely:

- ECS at the GSFC DAAC and GSFC V0 DAAC
- ECS at the MSFC DAAC and MSFC V0 DAAC (see note in 3.2.1)
- ECS at the LaRC DAAC and LaRC V0 DAAC
- ECS at the EDC DAAC and EDC V0 DAAC
- ECS at the JPL DAAC and JPL V0 DAAC
- ECS at the NSIDC DAAC and NSIDC V0 DAAC
- ECS at the ORNL DAAC and ORNL V0 DAAC
- ECS a the ASF DAAC and ASF V0 DAAC

The DAAC-to-DAAC and SMC interface diagram (Figure 3.2-4) shows the flow of data to and from the DAACs and the SMC at a site level. It does not capture the data flows at a subsystem level - these are captured in Section 3.2.3. The "generic" flows between V0 DAACs and between ECS DAACs are implied and are therefore not shown. What is shown for V0 DAACs are the data flows necessary to migrate V0 data from a V0 DAAC to ECS at other DAACs.

Looking at the portion of the N^2 diagram above the diagonal, data flows occur as follows, an entity found on the diagonal sends data to an entity found on the lower, right level on the diagonal. Looking at the portion of the N^2 diagram below the diagonal, data flows occur as follows, an entity found on the diagonal sends data to an entity found on the upper, left level on the diagonal.

3.3 SDPS Overview

The SDPS supports the services required to ingest, process, archive, access and manage science data and related information from the entire EOSDIS. More specifically the SDPS will provide hardware, software and operations to:

- ingest, process, archive and manage all data from EOS instruments and NASA Probe flight missions, other selected remotely sensed data, and their associated data products;
- receive, process, archive and manage ancillary data required by the EOSDIS algorithms;
- receive, archive and manage *in situ* correlative data;
- provide the Earth science community with access to all EOS data and other Earth Science data held by the ECS and the data products resulting from research using these data;

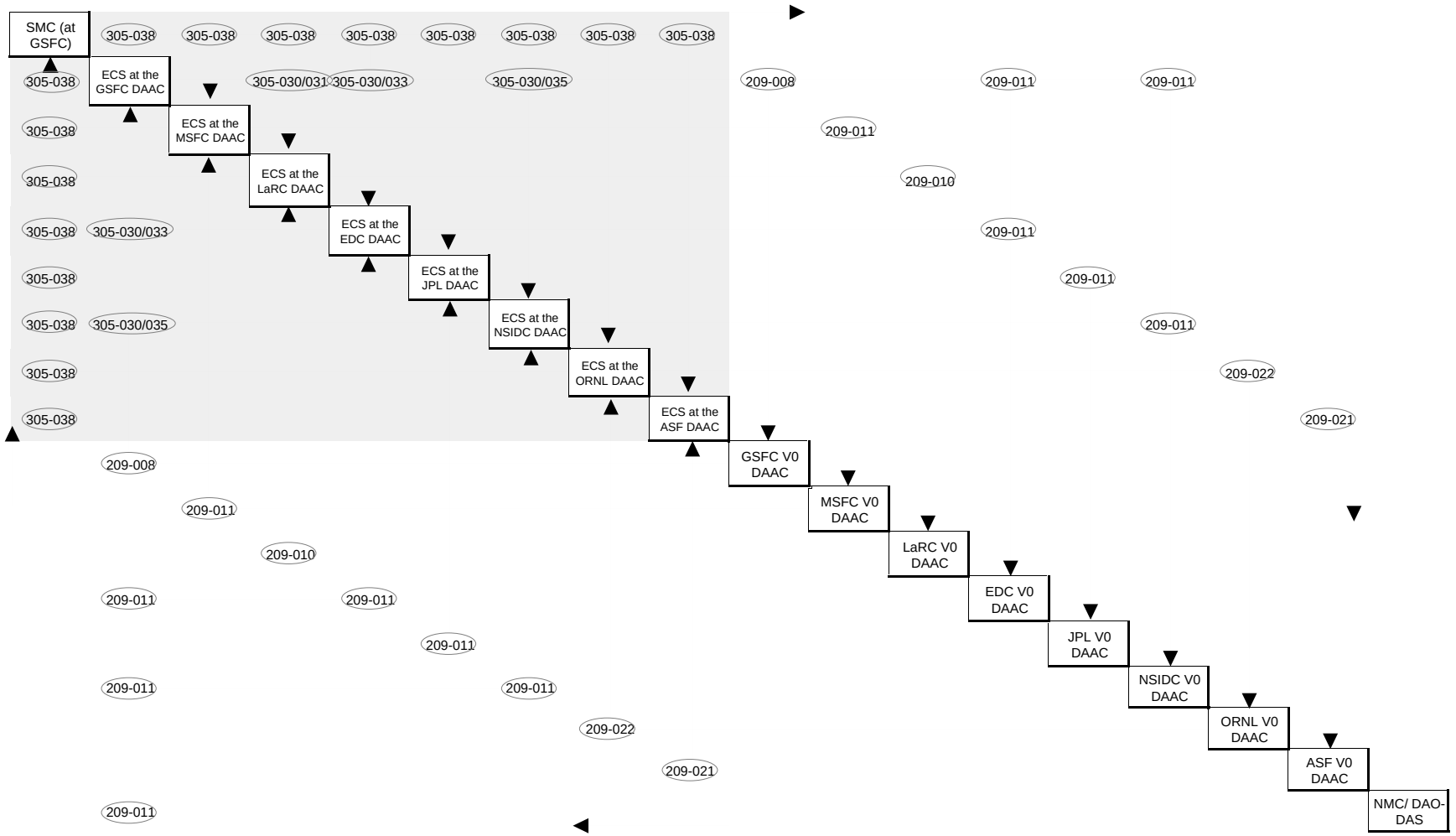

Figure 3.2-4. Unique DAAC to DAAC Interfaces

- promote effective utilization of data for research in support of the Mission to Planet Earth (MTPE) goals, by encouraging exchange of data and research results within the science community and across the multi-agency/multi-national data collection systems and archives; and
- facilitate development, experimental usage, and community acceptance of new and/or improved algorithms for computing geophysical parameters from remotely sensed data .

Further details on these objectives are provided in ECS Science Requirements Summary White Paper (FB9402V2).

The requirements allocated to SDPS in the Functional and Performance Requirements Specification (F&PRS) for the Earth Observing System Data and Information System (EOSDIS) [423-41-02] imply a certain system structure in terms of elements (i.e., Data Archive and Distribution System (DADS), Information Management System (IMS), and Product Generation System (PGS)) and element interfaces. Following extensive interaction with the user community as part of the requirements analysis activity it became clear that the defined elements were not ideal to provide an effective system to support Global Change research. At the ECS System Design Review (SDR), a new system structure was presented, which divides the segment into seven subsystems rather than the original three elements. In addition, the original system concept, as expressed in the F&PRS, implies that SDPS services are mainly located at Distributed Active Archive Centers (DAAC) identified in the specification. Although the system is being sized and configurations are being produced for this specific distribution concept, great care is being taken in the segment design so that services can be provided by any relevant facility within EOSDIS. Thus, if policy changes different system distribution configurations can be implemented without significant changes to the architectural design. This approach supports both user desires for an extended provider capability and DAAC desires for autonomous operation.

Finally, an important feature of the system concept is its openness for collaborative development by the user community and value-added service providers (e.g., educational suppliers). An attempt has been made in all areas of the design to encourage external developments which can work in conjunction with ECS supplied components. Examples of such developments include:

- additional site specific services offered through the ECS infrastructure by DAACs and Science Computing Facilities (SCF).
- user-supplied methods to perform specific processing functions on data
- new versions of ECS supplied components developed externally from the ECS core development activity which offer additional or more sophisticated services and can collaborate with ECS core components.

This concept has been driven not only by science needs expressed in the ECS User Model, but also by the need to allow the system to smoothly evolve during the development and operational phases.

3.4 CSMS Overview

The Communications and Systems Management Segment (CSMS) accomplishes the interconnection of users and service providers, transfer of information between ECS (and many EOSDIS) components, and enterprise management of all ECS components. It supports and interacts with the Science Data Processing Segment (SDPS) and the Flight Operations Segment (FOS).

The services provided by CSMS at the System Monitoring and Coordination Center, (SMC) located at Goddard Space Flight Center (GSFC), are collectively referred to as Enterprise Monitoring and Coordination (EMC) throughout this document. In the same context, services provided by CSMS at Distributed Active Archive Centers (DAACs) and the EOC (sites) are collectively referred to as Local System Management (LSM).

At its highest design level, CSMS consists of three parts:

- System Management Subsystem (MSS)

  MSS is a collection of applications which manage all ECS resources, including all SDPS, FOS, ISS, and CSS components. MSS directly uses CSS services.

- Communications Subsystem (CSS)

  CSS is a collection of services providing flexible interoperability and information transfer between clients and servers. CSS services correspond loosely to layers 5-7 of the Open Systems Interconnection Reference Model (OSI-RM).

- Internetworking Subsystem (ISS)

  ISS is a layered stack of communications services corresponding to layers 1-4 of the OSI-RM. CSS services reside over, and employ, ISS services.

The Systems Management Subsystem (MSS) common management services and management application services map to the Management CI (MCI), the Management Logistics CI (MLCI), the Management Agent CI (MACI), and the MSS Management Hardware CI (MHCI). The MHCI includes site specific configurations of workstations and servers for management of DAACs, EOC/ ICC, for WAN management, and for system-wide coordination and monitoring purposes.

The Communications Subsystem (CSS), comprised of three service superclasses, is mapped to the Distributed Computing CI (DCCI), and the Distributed Communications Hardware CI (DCHCI). All or parts of the DCCI are installed at every ECS machine to enable distributed communications. Machines are configured as clients and/or servers to meet specific implementation requirements. The DCHCI includes communication servers for security, directory, mail, and bulletin board services (software servers may share a physical server) as required to support specific site implementations.

The Internetworking Subsystem (ISS) includes three superclasses which are mapped to the Network CI (NWCI), and the Internetworking Hardware CI (INHCI). Part or all of the NWCI is installed on every ECS machine (end system), and on communication routers (intermediate systems) based on specific site implementation requirements. The INHCI includes routers, plant cabling (e.g., copper cables and optical fiber), and modem access devices required to support specific site implementations.

3.5 Requirements for Incremental Development

Two development approaches are being used on the ECS Project: formal development and incremental development.

Formal development is characterized by relatively long development cycles (18-24 months) with formal reviews, documentation, and testing. This development approach is typically used for mission critical areas of the system. Therefore, the CIs that comprise the Data Server, Ingest, Planning, Communications, Internetworking, System Management and Data Processing subsystems are being developed using the formal development approach.

Incremental development is characterized by a sequence of short development cycles (6-9 months each), with each increment building upon the previous one. It is used for areas of the system where it is desirable to obtain early user feedback and to minimize the turnaround time required to incorporate this feedback into the system.

The CIs that comprise the Client, Interoperability, and Data Management Subsystems are being developed on the incremental track. It is anticipated that user feedback will impact the Level 4 requirements; therefore, the Level 4 requirements for the Client, Interoperability, and Data Management subsystems are draft requirements. Final as-built requirements will be available after the increments are complete.

More detailed information on the ECS development approach can be found in the Systems Engineering Plan for the ECS Project (194-201-SEI-001).

This page intentionally left blank.